A STUDY AND ANALYSIS OF COOKING OIL QUALITY DETERMINER BASED ON PLANAR ELECTROMAGNETIC SENSOR ARRAY

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To my lovely mother, who gave me endless love, trust, constant encouragement over the years, and for her prayers .To my Family, for their patience, support, love, and for enduring the ups and downs during the completion of this project report. This project report is dedicated to them.

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ABSTRACT

Oil palm cooking oil is one of the main foods ingredients in Malaysian food. Almost all recipes are using oil palm cooking oil to cook the food. That's make the oil palm cooking oil become the main material for making a food. In this project, determining the quality of oil palm cooking oil will be the main issue. Therefore, this project ambitious to invent a low cost system for detecting the tainted cooking oil. As a result, the planar electromagnetic sensor array is proposed. Furthermore, electrochemical impedance spectroscopic (EIS) approach can describe the variation and characteristic of the oil palm cooking oil sample. EIS is about impedance level affected by the sample that being testing. This project suggests an alternative method for the detection of tainted cooking oil by developing a sensor array with the combination of planar meander and interdigital electromagnetic sensors for cooking oil quality inspection. The main objective is to fabricate the sensor array using printed circuit board (PCB). To project will study and analyze the value of the planar sensor impedance (real and imaginary part) as a function of frequency when subjected to cooking oil samples. The relationship between permittivity and conductivity will be determined after the reference measurement is obtained first. That means every result from sample is compare to the good cooking oil sample as reference. A set of experiments were conducted to determine the relationship between the sensor's output and the cooking oil parameter. To complete this project, two major parts should be carried out which are the hardware setup and result analysis. The hardware part is to get the result from the testing sample by developed a complete set of sensor and equivalent circuit. In the result analysis, the value of impedance from LCR meter will be used to estimate the type of cooking oil.

ABSTRAK

Minyak asak kelapa sawit adalah salah satu makanan yang bahan-bahan utama dalam makanan Malaysia. Hampir semua resipi yang menggunakan minyak masak kelapa sawit untuk memasak makanan. Ia membuatkan minyak masak kelapa sawit menjadi bahan utama di dalam pembuatan makanan. Dalam projek ini, menentukan kualiti minyak masak kelapa sawit akan menjadi isu utama. Oleh itu, projek ini mencipta satu sitem yang jimat dalam mengesan minyak masak yang tercemar. Hasilnya, "planar electromagnetic sensor" dicadangkan. Tambahan pula, electrochemical impedance spectroscopy (EIS) boleh mengesan variasi dan ciri-ciri sampel minyak masak kelapa sawit. EIS adalah mengenai tahap impedans terjejas oleh sampel yang menjadi ujian. Projek ini mencadangkan kaedah lain untuk mengesan minyak masak yang tercemar dengan menghasilkan pelbagai sensor dengan gabungan Meander satah dan sensor elektromagnet interdigital untuk memantau kadar kualiti sesuatu minyak masak. Objektif utama adalah untuk merekacipta pelbagai sensor yang menggunakan papan litar bercetak (PCB). Hubungan antara ketelusan dan kekonduksian akan ditentukan selepas pengukuran rujukan diperolehi pertama. Ini bermakna setiap hasil daripada sampel adalah berbanding dengan sampel minyak masak yang baik sebagai rujukan. Satu set eksperimen telah dijalankan untuk menentukan hubungan antara output sensor dan parameter minyak masak. Untuk menyiapkan projek ini, dua bahagian utama perlu dilakukan iaitu persediaan perkakasan dan analisis keputusan. Bahagian perkakasan adalah untuk mendapatkan keputusan daripada sampel ujian dengan membangunkan satu set lengkap sensor dan litar setara. Dalam analisis keputusan, nilai impedans dari LCR meter akan digunakan untuk menganggar jenis minyak masak